

IN THE CLAIMS

This listing of the claim will replace all prior versions and listings of claim in the present application.

Listing of Claims

1. (currently amended) A virtualization system for controlling data transfer between a host system and a plurality of storage devices, each of the storage devices having a disk controller, and a plurality of disk drives, and related to at least one logical volume ~~relating to a portion of the disk drives,~~ the virtualization system comprising:

a plurality of first ports coupled to the ~~plurality of storage devices;~~

a second port coupled to the host system;

a processing circuit ~~processor;~~ and

a memory configured to store mapping information ~~which, the mapping information indicating a relationship between~~ relates first volume identification information, which is used by the host system to access a virtual volume in the virtualization system, ~~to and~~ second volume identification information for identifying a first logical volume ~~corresponding to the virtual logical volume,~~ the first logical volume ~~being in~~ of a first storage device of the storage devices, the mapping information being used by the processing circuit for transferring ~~processor to transfer data, which are~~ sent from the host system and are related to the first volume identification information, to the first logical volume;

wherein the virtualization system receives data, which are sent from the host system and are ~~targeted~~ related to the first volume identification information, during a data transfer phase in which data stored in the first logical volume are transferred to a second logical volume ~~in~~ of a second

storage device of the storage devices, the data ~~targeted~~received during the
data transfer phase are~~to the first volume identification information is written~~
to the second logical volume; and

wherein, ~~when~~if the data transfer phase is completed, ~~the memory is~~
~~configured to store changed mapping information, instead of the mapping~~
information, is used for transferring data, which are sent from the host system
and are related to the first volume identification information, to the second
logical volume, the changed mapping information indicating a relationship
between ~~which relates the first volume identification information to~~and third
volume identification information for identifying the second logical volume and
being stored in the memory.

2. (currently amended) The virtualization system as recited in
Claim 1, wherein, upon receipt of data ~~targeted~~related to the first volume
identification information, the processing circuit ~~processor~~ controls data
transfer of the data ~~targeted~~related to the first volume identification
information to the first logical volume based on the ~~relation of volume~~
~~identification information in the mapping information.~~

3. (previously presented) The virtualization system as recited in
Claim 1, wherein the second volume identification information includes a port
identification of the first storage device related to the first logical volume and
a Logical Unit Number (LUN) identifying the first logical volume.

4. (previously presented) The virtualization system as recited in Claim 1, wherein the second volume identification information includes a identification number of the first logical volume.

5. (currently amended) The virtualization system as recited in Claim 1, wherein the memory is configured to store routing information which indicates a relationship of connection among the virtualization system, the storage devices, and the host system;

wherein the processing circuit~~processor~~, upon receipt of data from the host system or any of the storage devices, ~~decides whether to relate identification information of the received data to the volume identification information stored in the mapping information or not, and if the identification information of the received data relates to the volume identification information, sends~~ controls to send the received data to the host system or any of the storage devices according to the routing information.

6. (canceled).

7. (currently amended) The virtualization system as recited in Claim 1, wherein, when or after the data transfer phase ~~of data stored in the first logical volume to the second logical volume is completed~~, if a write request for access targeted~~related~~ to the first volume identification information is received from the host system, the processing circuit controls to send ~~processor sends a write request, which corresponds~~ corresponding to the write request related to the first volume identification information, to the second storage device having the second logical volume.

8. (currently amended) The virtualization system as recited in Claim 1, wherein the processing circuit ~~processor~~ is configured to be sent the mapping information from another computer system.

9. (currently amended) The virtualization system as recited in Claim 1, further comprising:

a third port for connection with a managing unit which is configured to control the virtualization system,

wherein the processing circuit ~~processor~~ is configured to monitor a state of connection with the storage devices connected through the plurality of first ports, and if a change in the connection state is detected, to notify the managing unit of the change in the connection state.

10. (currently amended) A virtualization system coupled to at least one host system and a plurality of storage devices, said storage devices each having a plurality of disk drives ~~and related to~~ at least one logical volume related to a portion of the disk drive, the virtualization system comprising:

a plurality of first ports coupled to the storage devices;

at least one second port coupled to the host system; and

a first processor configured to convert first volume identification information, which is related to a first data received from the host system and is used to identify a virtual volume of the virtualization system, into second volume identification information for identifying a first logical volume in a first storage device of the storage devices according to relationship information between the first volume identification information and the second volume

identification information, and to send the first data related to the second volume identification information to the first storage device;

wherein the virtualization system receives a second data, which is sent from the host system and is related to the first volume identification information, during a data transfer phase in which data stored in the first logical volume are transferred to a second logical volume in a second storage device of the storage devices, the ~~received~~ second data is written to the second logical volume;

wherein, if the data transfer phase is completed, ~~the relationship information is changed to new relationship information~~ is referred to by the first processor for sending data received from the host system to the second storage device, the new relationship information being changed from the relationship information and indicating a relationship between the first volume identification information and third volume identification information for identifying the second logical volume; and

wherein the first processor is configured to convert the first volume identification information, which is related to ~~another~~ a third data received from the host system, into the third volume identification information according to the new relationship information, and to send the third data related to the third volume identification information to the second storage device.

11. (previously presented) The virtualization system as recited in Claim 10, wherein the second volume identification information includes a port identification of the first storage device and a Logical Unit Number (LUN) identifying the first logical volume.

12. (currently amended) The virtualization system as recited in Claim 10, further comprising:

a second processor which controls the process of transferring of data stored in a third logical volume corresponding to another virtual volume to a fourth logical volume, and

wherein, if the process of transferring of data stored in the third logical volume to the fourth logical volume is completed, fourth volume identification information, which is used to identify the another virtual volume, is related to the fifth volume identification information for identifying the fourth logical volume.

Claim 13 (canceled).

14. (previously amended) The virtualization system as recited in Claim 10, further comprising at least one third port coupled to a managing unit, wherein the managing unit is configured to send the relationship information to the virtualization system.

Claim 15 (canceled).

16. (currently amended) A method of controlling data transfer in a virtualization system coupled to a host system and a plurality of storage devices, the host system using first volume identification information to access for accessing a virtual volume in of the virtualization system, and each

of the storage devices having a plurality of disk drives and a logical volume related to a portion of the disk drives, the method comprising:

referring to a first mapping information between relating the first volume identification information for identifying the virtual logical volume to and second volume identification information for identifying a first logical volume in of a first storage device of the storage devices;

transferring, for a data migration of the virtual volume, data stored in the first logical volume to a second logical volume in of a second storage device of the storage devices;

receiving data of a first write data input request sent from the host system during the transferring step, the first write data input request having including the first volume identification information,

the data of the first write data input request being written to the second logical volume; and

based upon transferring substantially all data stored in the first logical volume to the second logical volume, referring to a second mapping information between relating the first volume identification information to and third volume identification information for identifying the second logical volume so that the virtualization system can read data requested by a first read request from the second logical volume, the first read request being sent from the host system and including the first volume identification information.

17. (currently amended) The method of controlling data transfer as recited in Claim 16, further comprising:

~~registering the first volume identification information and the third volume identification information in~~ the second mapping information in a memory;

receiving a second write data input/output request, sent from the host system, ~~and targeted to the virtual volume~~ after the transferring of substantially all data stored in the first logical volume to the second logical volume;

converting the first volume identification information related to the second write data input/output request into the third volume identification information based on the second mapping information; and

transferring the converted second write data input/output request to the second logical volume ~~after registering the first volume identification information and the third volume identification information.~~

18. (currently amended) The method of controlling data transfer as recited in Claim 16, further comprising:

receiving a second write input/output request, which is sent from the host system and is targeted to the virtual volume; and

based upon the transferring the of substantially all data stored in the first logical volume to the second logical volume, sending a write request c to the second write input/output request to the second storage device based on the second mapping information ~~after relating the first volume identification information to the third volume identification information.~~

19. (currently amended) A method of controlling data transfer of a virtualization system, which couples to a host system, a first storage device and a second storage device ~~and has a virtual volume related to a first logical volume related to a portion of a plurality of disk drives in the first storage device~~, the method comprising:

transferring first data sent from the host system to ~~the~~ a first logical volume related to a portion of a plurality of disk drives in the first storage device after changing first volume identification information, which is related to the first data sent from the host system and is used to identify the a virtual volume, into second volume identification information for identifying the first logical volume by using a first relationship between the first volume identification information and the second volume identification information;

transferring substantially all data from the first logical volume to a second logical volume related to a portion of a plurality of disk drives in the second storage device;

~~writing second data being sent from the host system during the~~ transferring of substantially all data from the first logical volume to the second logical volume, and being related to the first volume identification information, the second data being written to the second logical volume; and

using a second relationship between the first volume identification information and third volume identification information for identifying the second logical volume instead of the first relationship, if the transferring of substantially all data from the first logical volume to the second logical volume is completed; and

transferring ~~another~~ third data sent from the host system to the second logical volume after changing the first volume identification information, which is related to the ~~another~~ third data sent from the host system, into the third volume identification information by using ~~after setting the~~ second relationship.

20. (currently amended) The method as recited in Claim 19, further wherein the virtual volume is related to virtual port identification information.

21. (currently amended) The method as recited in Claim 19, wherein the ~~another~~ third data sent from the host system is related to the first volume identification information and virtual port identification information of the virtualization system, and wherein the transferring of the ~~another~~ third data sent from the host system to the second logical volume comprises sending transferring the ~~another~~ third data related to the third volume identification information and port identification information of the second storage device from the virtualization system to the second logical volume.

22. (currently amended) The method as recited in Claim 19, wherein the first volume identification information being related ~~relates to~~ virtual port identification information of the virtualization system.

23. (previously presented) The method as recited in Claim 19, wherein the first volume identification information and virtual port identification information of the virtualization system are used to identify the virtual volume.

24. (currently amended) A method of controlling data transfer by a virtualization system coupled to a host system and a plurality of storage devices, the host system accessing a virtual volume of the virtualization system, each of said storage devices having a plurality of disk drives and a logical volume related to a portion of the disk drives, the method comprising:

receiving a first read request with ~~related to~~ a first volume identification information, ~~which is used to identify the virtual volume,~~ from the host system; the first volume identification information being used to identify the virtual volume;

sending, based on the received first read request, a second read request related to ~~with a second volume identification information, which is used to identify a first logical volume of a first storage device of the storage devices,~~ to ~~the~~ a first logical volume of a first storage device of the storage devices by using first relationship information between the first volume identification information and the second volume identification information, the second volume identification information being used to identify the first logical volume;

receiving first data requested by the second request from the first storage device;

sending the received first data to the host system;

transferring data from the first logical volume to a second logical volume of a second storage device of the storage devices;

second writing data being sent from the host system during the transferring of data from the first logical volume to the second logical volume

and being related to the first volume identification information, the second data being written to the second logical volume; and

using, for sending data targeted to the virtual volume controlling a read request related to the first volume identification information, second relationship information between the first volume identification information and third volume identification information, which is used to identify the second logical volume, if the transferring of data from the first logical volume to the second logical volume is completed,

receiving a third request with-related to the first volume identification information from the host system after the transferring of data from the first logical volume to a second logical volume is completed;

sending, based on the received-the received third request, a fourth request with-related to a-the third volume identification information, which is used to identify the second logical volume, to the second logical volume by using the second relationship information;

receiving another-third data requested by the fourth request from the second storage device; and

sending the received another-third data to the host system.

25. (currently amended) The method of controlling data transfer as recited in Claim 24, wherein the step of the data transfer transferring of data from the first logical volume to the second logical volume comprises:

receiving from a managing unit a command of the second relationship information from a management unit; and

storing the second relationship information based on the command.

26. (previously presented) The method of controlling data transfer as recited in Claim 24, further comprising:

storing the second relationship information.

27. (previously presented) The virtualization system as recited in Claim 1, wherein the virtual volume corresponds to a virtual port of the virtualization system.

28. (currently amended) The virtualization system as recited in Claim 1,

wherein the mapping information indicates a relationship between ~~relates~~-first port identification information of the virtualization system, which is used by the host system to access the virtual logical volume, ~~to and~~ second port identification information for identifying a second port of the first storage device, and

wherein, based on that the data stored in the first logical volume are transferred to the second logical volume, ~~the processor relates~~ the changed mapping information indicates relationship between the first port identification information to a third port identification information for identifying a third port of the second storage device, ~~and registers the third port identification information related to the first port identification information in the mapping information.~~

29. (previously presented) The virtualization system as recited in Claim 10, wherein the virtual volume corresponds to a virtual port of the virtualization system.

30. (currently amended) The virtualization system as recited in Claim 10, wherein the relationship information ~~is further~~ indicates a relationship between ~~related~~ first port identification information of the virtualization system, which is used by the host system to access the virtual volume, ~~to and~~ second port identification information for identifying a second port of the first storage device, and

wherein, if the data transfer phase is completed, ~~the new relationship information is related~~ a relationship between the first port identification information ~~to and~~ a third port identification information for identifying a third port of the second storage device is referred by the first processor.

31. (previously presented) The method of controlling data transfer as recited in Claim 16, wherein the virtual volume corresponds to a virtual port of the virtualization system.

32. (currently amended) The method of controlling data transfer as recited in Claim 16, further comprising:

relating first port identification information of the virtualization system, which is used by the host system ~~to access~~ for accessing the virtual volume, to second port identification information for identifying a second port of the first storage device, and

~~based upon transferring the all data stored in the first logical volume to the second logical volume, relating the first port identification information to a third port identification information for identifying a third port of the second storage device.~~

33. (previously presented) The virtualization system as recited in Claim 1, wherein the first volume identification information is a Logical Unit Number (LUN) of the virtual volume and is related to a virtual port identification information of the virtual volume.

34. (currently amended) The virtualization system as recited in Claim 1, further comprising:

the virtualization system including a switch having the first ports, the second port, the ~~processor~~processing circuit and the memory.

35. (currently amended) The virtualization system as recited in Claim 1, ~~further comprising wherein the a~~ processing circuit configured configures to convert the first volume identification information, which is related to data received from the host system, into the third volume identification information according to the changed mapping information and to send data related to the third volume identification information to the second storage device.

36. (currently amended) The virtualization system as recited in Claim 1, further comprising:

~~a processing circuit configured to convert the first volume identification information, which is related to data received from the host system, into the third volume identification information according to the changed mapping information and to send data related to the third volume identification information to the second storage device~~

another processing circuit configured to convert fourth volume identification information, which is related to data received from the host system and is used to identify another virtual volume of the virtualization system, into fifth volume identification information for identifying a third logical volume in of a third storage device of the storage devices according to mapping information between the fourth volume identification information and the fifth volume identification information and to send data related to the fifth volume identification information to the third storage device.

37. (previously presented) The virtualization system as recited in Claim 10, wherein the first volume identification information is a Logical Unit Number (LUN) of the virtual volume and is related to a virtual port identification information of the virtual volume.

38. (previously presented) The virtualization system as recited in Claim 10, further comprising:

the virtualization system including a switch having the first ports, the second port and the first processor.

39. (currently amended) The virtualization system as recited in Claim 10, further comprising:

a second processor configured to convert fourth volume identification information, which is related to fourth data received from the host system and is used to identify another virtual volume of the virtualization system, into fifth volume identification information for identifying a third logical volume in a third storage device of the storage devices according to relationship information between the fourth volume identification information and the fifth volume identification information and to send the fourth data related to the fifth volume identification information to the third storage device.

40. (previously presented) The method of controlling data transfer as recited in Claim 16, wherein the first volume identification information includes a Logical Unit Number (LUN) identifying the virtual volume and is related to a virtual port identification information of the virtualization system.

41. (previously presented) The method of controlling data transfer as recited in Claim 16, wherein:

the virtualization system is a switch system.

42. (currently amended) The method of controlling data transfer as recited in Claim 16, wherein:

receiving, by the virtualization system, ~~a~~ the first data input/output read request, ~~which is sent from the host system and is targeted to the virtual~~ volume;

converting, by control of a first processing circuit in the virtualization system, the first volume identification information ~~related to~~ included in the first data input/output read request into the third volume identification information

~~based on the second mapping information after relating the first volume identification information to the third volume identification information;~~

transferring, by control of the first processing circuit, the converted first ~~data input/output~~read request to the second logical volume;

receiving, by the virtualization system, a second ~~data input/output~~read request, which is sent from the host system or another host system and is ~~targeted to~~includes fourth volume identification information for identifying another virtual volume;

converting, by control of a second processing circuit in the virtualization system, ~~a the fourth volume identification information, which is used to identify the another virtual volume and is related to the second data input/output~~read request, into ~~a fifth volume identification information for identifying a third logical volume in of a third storage device of the storage devices; and~~

transferring, by control of the second processing circuit, the converted second ~~data input/output~~read request to the third logical volume.

43. (currently amended) The method as recited in Claim 19, wherein the first volume identification information is a Logical Unit Number (LUN) of the virtual logical volume and is related to a virtual port identification information of the virtual volume.

44. (previously presented) The method as recited in Claim 19, wherein: the virtualization system is a switch system.

45. (currently amended) The method as recited in Claim 19, wherein:

receiving, by the virtualization system, a first ~~data input/output~~read request, which is sent from the host system and is targeted to the virtual volume;

changing, by control of a first processing circuit in the virtualization system, the first volume identification information of the first ~~data input/output~~read request into the third volume identification information after ~~setting~~by using the second relationship;

transferring, by control of the first processing circuit, the changed first ~~data input/output~~read request to the second logical volume;

receiving, by the virtualization system, a second ~~data input/output~~read request, which is sent from the host system or another host system and is targeted to another virtual volume;

changing, by control of a second processing circuit in the virtualization system, a fourth volume identification information, which is used to identify the another virtual volume and is related to the second ~~data input/output~~read request, into a fifth volume identification information for identifying a third logical volume in a third storage device;

transferring, by control of the second processing circuit, the changed second ~~data input/output~~read request to the third logical volume.

46 (previously presented) The method of controlling data transfer as recited in Claim 24, wherein the first volume identification information is a Logical Unit Number (LUN) of the virtual volume and is related to a virtual port identification information of the virtual volume.

47. (previously presented) The method as recited in Claim 24,
wherein: the virtualization system is a switch system.

48. (currently amended) The method as recited in Claim 24,
wherein:

receiving, by the virtualization system, a fifth read request, which is
sent from the host system and is targeted to the virtual volume;

changing, by control of a first processing circuit in the virtualization
system, the first volume identification information related to the fifth request
into the third volume identification information ~~based on~~ by using the second
relationship information ~~so that a sixth request with the third volume~~
~~identification information is created based on the fifth request;~~

~~sending~~ transferring, by control of the first processing circuit, ~~the a sixth~~
request related to the third volume identification information to the second
logical volume;

receiving, by the virtualization system, a seventh request, which is sent
from the host system or another host system and is targeted to another virtual
volume;

changing, by a second processing circuit in the virtualization system, a
fourth volume identification information, which is used to identify the another
virtual volume and is related to the seventh request, into a fifth volume
identification information for identifying a third logical volume ~~in~~ of a third
storage device of the storage devices ~~so that a eighth request with the fifth~~
~~volume identification information is created based on the seventh request;~~

transferring, by the second processing circuit, ~~the~~an eighth request
related to the fifth volume identification information to the third logical volume.

49. (new) The method as recited in Claim 1, wherein the data received during the data transfer phase are further written to the first logical volume.

50. (new) The method as recited in Claim 10, wherein the second data is further written to the first logical volume.

51. (new) The method as recited in Claim 16, wherein the data of the first write request is further written to the first logical volume.

52. (new) The method as recited in Claim 19, wherein the second data is further written to the first logical volume.

53. (new) The method as recited in Claim 24, wherein the second data is further written to the first logical volume.